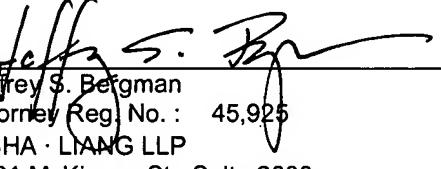




5-23-07

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<b>TRANSMITTAL OF APPEAL BRIEF</b>		Docket No. 17344/122002
In re Application of: Gary G. Podrebarac et al.		
Application No. 10/820,399-Conf. #8465	Filing Date April 7, 2004	Examiner W. D. Griffin
Invention: PROCESS FOR THE SELECTIVE DESULFURIZATION OF A MID RANGE GASOLINE CUT		
<b><u>TO THE COMMISSIONER OF PATENTS:</u></b>		
Transmitted herewith is the Amended Appeal Brief in this application, with respect to the Notice of Appeal		
filed: <u>November 30, 2005</u>		
The fee for filing this Appeal Brief is _____.		
<input checked="" type="checkbox"/> Large Entity <input type="checkbox"/> Small Entity		
<input type="checkbox"/> A petition for extension of time is also enclosed.		
The fee for the extension of time is _____.		
<input type="checkbox"/> A check in the amount of _____ is enclosed.		
<input type="checkbox"/> Charge the amount of the fee to Deposit Account No. <u>50-0591</u> . This sheet is submitted in duplicate.		
<input type="checkbox"/> Payment by credit card. Form PTO-2038 is attached.		
<input checked="" type="checkbox"/> The Director is hereby authorized to charge any additional fees that may be required or credit any overpayment to Deposit Account No. <u>50-0591</u> . This sheet is submitted in duplicate.		
 Jeffrey S. Bergman Attorney Reg. No.: 45,925 OSHA · LIANG LLP 1221 McKinney St., Suite 2800 Houston, Texas 77010 (713) 228-8600		Dated: <u>May 22, 2007</u>



Docket No.: 17344/122002 (CDT 1788 CON)  
(PATENT)

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

In re Patent Application of:  
Gary G. Podrebarac et al.

Application No.: 10/820,399

Confirmation No.: 8465

Filed: April 7, 2004

Art Unit: 1764

For: PROCESS FOR THE SELECTIVE  
DESULFURIZATION OF A MID RANGE  
GASOLINE CUT

Examiner: W. D. Griffin

**AMENDED APPEAL BRIEF**

MS Appeal Brief - Patents  
Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

Dear Sir:

This amended appeal brief is submitted in response to the Notice of Non-Compliant Appeal Brief dated 04/23/2007. In the Notice, the brief was indicated as failing to comply with 37 C.F.R. § 41.37 due to a) the summary of claimed subject matter failed to identify and map each independent claim to the specification and line number and to the drawings, and b) the status of claims failed to identify all claims filed in the application.

Applicant believes this reply is fully responsive to all outstanding issues. If this belief is incorrect, or other issues arise, the Examiner is encouraged to contact the undersigned or his associates at the telephone number listed below. Applicant believes no fee is due with this Amended Appeal Brief. However, if a fee is due, please charge

our Deposit Account No. 50-0591, under Order No. 17344/122002 from which the undersigned is authorized to draw.



## TABLE OF CONTENTS

This brief contains items under the following headings as required by 37

C.F.R. § 41.37 and M.P.E.P. § 1206:

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## **I. REAL PARTY IN INTEREST**

The subject patent application is a continuation of Application No. 10/093,880, assigned of record to Catalytic Distillation Technologies, by virtue of assignment as recorded at reel 012687, frame 0562. Therefore, the real party in interest is Catalytic Distillation Technologies.

## **II. RELATED APPEALS AND INTERFERENCES**

There are no related appeals or interferences known to Appellants or Appellants' legal representative which will directly or indirectly affect or be affected by or have a bearing on the Board's decision in this appeal.

### **III. STATUS OF CLAIMS**

The present application, Serial No. 10/820,399 was filed on April 7, 2004, and claims priority to application Serial No. 10/093,880, filed on March 8, 2002, now U.S. Patent No. 6,824,676.

#### **A. Total Number of Claims in the Application**

As originally filed, this application contained 13 claims.

#### **B. Current Status of Claims**

- a. Claims Canceled: claims 1-12 were canceled in a Preliminary Amendment.
- b. Claims withdrawn from consideration but not canceled: none.
- c. Claims pending: claim 13.
- d. Claims Allowed: none.
- e. Claims rejected: claim 13.
  - i. Claim 13 stands rejected under 35 U.S.C. § 103(a).

#### **C. Claims on Appeal**

- a. Claim 13 is the only claim on appeal.

#### **IV. STATUS OF AMENDMENTS**

All amendments have been entered.

## **V. SUMMARY OF THE CLAIMED SUBJECT MATTER**

There is only one claim on appeal. There are no means plus function or step plus function recitations under 35 USC 112, sixth paragraph recited in the claim.

In general, the claimed subject matter is a process for removal of sulfur from a full boiling range fluid cracked naphtha stream to meet higher standards for sulfur removal. The process includes splitting the light portion of the stream utilizing a three-way naphtha splitter as a distillation column reactor to treat the lightest boiling range naphtha to remove the mercaptans contained therein by thioetherification and treating the components of the naphtha feed with the process that preserves the olefinic while most expediently removing the sulfur compounds (*see* Specification, page 4, lines 17-26). The mercaptans are reacted with diolefins in the naphtha to form sulfides, and are removed from the distillation column reactor as sulfides (*see* Specification, page 4, lines 23-26; Specification, page 6, lines 6-10).

As recited in claim 13, and shown in the Figure, naphtha 101 and hydrogen 102 are fed to a distillation column reactor 10 (*see* Specification, page 10, lines 14-18). The naphtha contains olefins, diolefins, mercaptans, thiophenes, and other organic sulfur compounds (*see* Detailed Description, throughout; *see also* Examples 1-3). The light naphtha is boiled up into the catalyst beds 11 and 12, in the rectification section, where the mercaptans react with diolefins in the naphtha to form sulfides which are higher boiling and thus are separated out with the heavy naphtha (*see* Specification, page 10, lines 18-21). The heavy naphtha and sulfides are taken from distillation column 10 as bottoms 104 (*see* Specification, page 10, lines 30-31). The light naphtha, having reduced

sulfur content, is removed from distillation column 10 as overheads 103 (*see* Specification, page 10, lines 24-25). The mid-cut (intermediate naphtha) sidedraw 105, a thiophene cut, is taken from distillation column reactor 10 and passed to a thiophene reactor 40 where the desired sulfur level is obtained (*see* Specification page 11, lines 12-13).

## **VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL**

The only ground of rejection presented for review on appeal is whether claim 13 is unpatentable under 35 U.S.C. § 103(a) as being obvious over Hearn et al. (U.S. Patent No. 5,597,476) in view of McDaniel *et al.* (U.S. Patent Application Publication No. 20030136706). The references cited by the examiner and relied on in the final rejection are attached in (IX) EVIDENCE APPENDIX.

## VII. ARGUMENT

### GROUND: THE REJECTION OF CLAIM 13 AS BEING OBVIOUS UNDER 35 U.S.C

#### § 103(a) OVER HEARN ET AL. IN VIEW OF McDANIEL ET AL.

Under § 103, the scope and content of the prior art are to be determined; the differences between the prior art and the claims at issue are to be ascertained; and the level of ordinary skill in the pertinent art resolved. Against this background, the obviousness or nonobviousness of the subject is determined. *See Graham v. John Deere*, 383 U.S. 1 (1966).

Claim 13 recites a process for removal of sulfur from a full boiling range fluid cracked naphtha stream. The process includes: feeding hydrogen and a full boiling range naphtha feed to a distillation column reactor; concurrently reacting and separating components of the full range naphtha feed in the distillation column reactor; removing a light naphtha overheads containing substantially no mercaptans, sulfides, or other organic sulfur compounds; removing an intermediate naphtha side draw containing thiophene, diolefins, and mercaptans; removing a heavy naphtha bottoms containing sulfides and other organic sulfur compounds; and feeding the intermediate naphtha to a single pass fixed bed reactor containing a hydrodesulfurization catalyst, where substantially all of any remaining sulfides and other organic sulfur compounds are reacted with hydrogen to form hydrogen sulfide.

Hearn *et al.* feed naphtha to a first distillation column reactor, which acts as a depentanizer or dehexanizer, with the lighter material containing most of the olefins and mercaptans being boiled up into a first distillation reaction zone where the

mercaptans are reacted with diolefins to form sulfides, which are removed in the bottoms along with any higher boiling sulfur compounds. The bottoms, which contain the sulfides, thiophenes, and heavier mercaptans (see col. 2, lines 46-56; col. 3, lines 51-53; col. 4, lines 4-5, lines 41 - 43; col. 6, lines 62-64; col. 7, lines 6-20 and claims), are subjected to hydrodesulfurization in a second distillation column reactor where the sulfur compounds are converted to hydrogen sulfide and removed. The lighter fraction, containing most of the olefins, is not subjected to the harsh hydrogenation conditions of the second reactor. The point of Hearn *et al.* is the removal of sulfur compounds, without reducing the olefin content of the feed.

Thus, in Hearn *et al.* the thiophenes are contained in the bottoms stream. Additionally, there is no suggestion in Hearn *et al.* that they be anywhere else.

In contrast, in the present invention it has been found that a light FCC naphtha cut (side draw) below the light fraction (overheads) also contains mercaptans and a significant amount of thiophenes. The thioetherification carried out in the present process converts mercaptans to sulfides by the reaction with diolefins. The sulfides are heavy and are removed in the bottoms. The thiophenes in the present process do not react to form the heavy sulfides. Thus, the mercaptans in the light FCC naphtha cut may be removed by the thioetherification, **but the thiophenes remain**, and this cut will not meet sulfur requirements (see Specification, page 4, lines 7-10).

The Examiner notes that Hearn does not separate the naphtha into three fractions nor the further hydrodesulfurization of an intermediate fraction. *See* Final Office Action, page 3, third full paragraph.

McDaniel *et al.* disclose a process for producing a product of reduced sulfur content from an olefin-containing hydrocarbon feedstock which includes sulfur-containing impurities. The feedstock is contacted with an olefin-modification catalyst in a reaction zone under conditions which are effective to produce an intermediate product which has a reduced amount of olefinic unsaturation. The intermediate product is then separated into at least three fractions, and the highest boiling first fraction is contacted with a hydrodesulfurization catalyst to convert at least a portion of the sulfur-containing impurities to hydrogen sulfide. The lowest boiling fraction is substantially free of sulfur-containing compounds. The intermediate boiling fraction is contacted with a selective hydrotreating catalyst to convert at least a portion of its sulfur-containing impurities to hydrogen sulfide. *See, for example*, McDaniel *et al.*, page 10, paragraphs [0093]-[0095], among others.

While it is true that McDaniel *et al.* carries out a reaction of a hydrocarbon stream containing thiophenes then splits the product into at least three streams for further handling, it also true that the thiophenic compounds undergo conversion to the refractory sulfur compounds (*see* McDaniel *et al.* paragraph [0049]) which are in the third fraction which also contains the thiophenic compounds and which is subjected to the vigorous hydrodesulfurization (*see* McDaniel *et al.* paragraph [0051]). Thus, McDaniel *et al.* is treating essentially the same fraction as Hearn, *i.e.*, the bottoms, with no suggestion in the references to do anything else. However, the reactions in Hearn are not the same as McDaniel since the thiophenic compounds react (are converted) in the process of McDaniel *et al.*

It is respectfully submitted that the combination of references, fails to make out a *prima facie* case of obviousness. Furthermore, there would appear to be no thiophenes in McDaniel's intermediate stream, hence the proposed rationale that it would be obvious to separate the Hearn product into 3 streams and to treat the intermediate stream, as McDaniel *et al.* (the third or heavy stream) is rebutted by the facts that the intermediate stream of Hearn *et al.* can be expected to contain thiophene, while the intermediate stream of McDaniel *et al.* does not.

There would be no incentive to split Hearn's product into 3 streams based on McDaniel *et al.* since, as is taught by McDaniel *et al.*, the refractory adducts and thiophenic compounds are being treated **in the bottom fraction**. It is not shown or remotely suggested by either reference that a thiophene cut should be separately removed and treated, as is required in claim 13. The thiophenes would not require the strong hydrogenation of the refractory bottoms of either Hearn *et al.* or McDaniel *et al.* Thus, the **olefin** content and hence the octane rating of the overall streams will be greater by having the thiophene treated separately from the other bottoms.

Claim 13 requires that the thiophenes are in the intermediate fraction not the bottoms, which is removed and treated:

- (d) removing an intermediate naphtha as a side draw from said distillation column reactor containing thiophene, diolefins boiling in the range of thiophene and mercaptans boiling in the range of thiophene ...
- (f) feeding said intermediate naphtha to a single pass fixed bed reactor containing a hydrodesulfurization catalyst where substantially all of any remaining

sulfides and other organic sulfur compounds are reacting with hydrogen to form hydrogen sulfide."

The Examiner has urged that McDaniel's examples show the intermediate fraction contains thiophenes, but TABLE V is deceptive. In fact the examples are not consistent with the McDaniel *et al.* disclosure. In paragraph [0138], McDaniel *et al.* is at great pain to point out that the fractionation was less than ideal, and if the fractionation had been carried out ideally, the sulfur level (which would include the thiophenes) would have been significantly lower in the overheads and the intermediate fraction (100-200°C). McDaniel *et al.* points out the results of the test would have been significant if the fractionation had been more ideal. In other words the example is not in line with McDaniel's invention. In the invention the sulfur would have been in the bottoms, not in either the overheads or the intermediate fraction and the disclosures would not have provided any incentive for treating the intermediate fraction. It would be inappropriate to rely on that which the inventor of the reference teaches to be not the desired or expected result to achieve the objectives of the invention.

It is well settled that a rejection based on § 103 must rest upon a factual basis rather than conjecture or speculation. "Where the legal conclusion [of obviousness] is not supported by the facts it cannot stand." *In re Warner*, 379 F.2d 101 1, 101 7, 154 USPQ 173, 178 (CCPA 1967); see also *In re Sporck*, 301 F.2d 686, 690, 133 USPQ 360,364 (CCPA 1962). "Obviousness cannot be established by combining teachings of the prior art to produce the claimed invention, absent some teaching suggestion or incentive supporting the combination." *In re Geiger*, 2 USPQ2d 1276 (CAFC 1987). Hence, without the requisite teaching, suggestions or incentives there is no *prima facie*

case and the rejection must fail. See also *In re Fine*, 5 USPQ2d 1596 and *Ex parte Levengood*, 28 USPQ2d 1300 (BPAI 1993). It is submitted that the total failure of either reference to express any interest in the thiophene cut, but rather to treat the thiophenes as just another component of the heavy fraction (and as detailed above, McDaniel *et al.* states the sulfur compounds are in the bottoms if the lab work had been carried out properly) fails to provide any incentive to rearrange and modify the two reference processes to arrive at the present claimed invention.

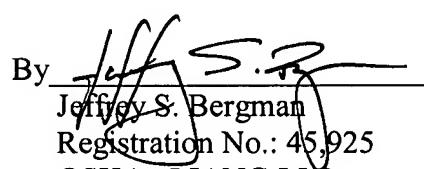
### Conclusion

It is submitted that the combinations of art as proposed by the examiner is based on the Applicants' motivation to make the claimed invention rather than any suggestion in the references. Applicants respectfully request that the Board reverse the examiner.

Dated: May 22, 2007

Respectfully submitted,

By

  
Jeffrey S. Bergman

Registration No.: 45,925

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## VIII. CLAIMS APPENDIX

1-12. (Canceled)

13. A process for removal of sulfur from a full boiling range fluid cracked naphtha

stream comprising the steps of:

- (a) feeding hydrogen and a full boiling range naphtha feed containing olefins, diolefins, mercaptans, thiophene and other organic sulfur compounds to a distillation column reactor;
- (b) concurrently in said distillation column reactor:
  - (i) reacting a portion of the mercaptans contained within said full boiling range naphtha stream with a portion of the diolefins contained within said full boiling range naphtha stream to produce sulfides and
  - (ii) separating said full boiling range naphtha stream into three fractions by fractional distillation;
- (c) removing product from said distillation column reactor comprising a light naphtha containing substantially no mercaptans, sulfides or other organic sulfur compounds as an overheads;
- (d) removing an intermediate naphtha as a side draw from said distillation column reactor containing thiophene, diolefins boiling in the range of thiophene and mercaptans boiling in the range of thiophene;
- (e) removing a heavy naphtha from said distillation column reactor containing said sulfides and other organic sulfur compounds as a bottoms;

(f) feeding said intermediate naphtha to a single pass fixed bed reactor containing a hydrodesulfurization catalyst where substantially all of any remaining sulfides and other organic sulfur compounds are reacting with hydrogen to form hydrogen sulfide.

## **IX. EVIDENCE APPENDIX**

A copy of each reference cited by the examiner and relied on in the  
rejection:

U.S. 5,597,476 (Hearn et al)

U.S. 200310136706 (McDaniel et al)

## **X. RELATED PROCEEDINGS APPENDIX**

None.

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

Name of Applicant: CATALYTIC DISTILLATION TECHNOLOGIES

Address of Applicant: 10100 Bay Area Boulevard

Pasadena, Texas 77507

Commissioner for Patents

P. O. Box 1450

Alexandria, VA 22313-1450

**REVOCATION AND SUBSTITUTION  
OF POWER OF ATTORNEY UNDER 37 C.F.R. §1.36**

Dear Sir:

Pursuant to 37 C.F.R. §1.36, CATALYTIC DISTILLATION TECHNOLOGIES, the applicant of the patent applications listed on the attached APPENDIX A, revokes all previous powers of attorney in the patent applications listed on the attached APPENDIX A, hereby appoints the following attorneys and/or agents assigned to the Customer Number listed below to prosecute the patent applications listed on the attached APPENDIX A, and to transact all business in the U.S. Patent and Trademark Office connected therewith:

Customer Number 70312

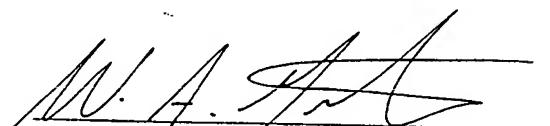
Please direct all correspondence and telephone calls concerning the patent applications listed on the attached APPENDIX A to the address associated with Customer Number 70312.

Further, please change the attorney/docket number corresponding to the patent applications listed in APPENDIX A from the attorney/docket number on file to that indicated on APPENDIX A.

The undersigned (whose title is supplied below) is empowered to sign this certificate on behalf of the above-identified applicant.

The undersigned hereby declares that all statements made herein of the undersigned's own knowledge are true, that all statements made on information and belief are believed to be true, and further, that these statements are made with the knowledge that willful false statements, and the like so made, are punishable by fine or imprisonment, or both, under Section 1001, Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the patent applications listed on the attached APPENDIX A or any patents issuing thereon.

Signature:



Dated:

8 May 2007

Name:

Willibrord A. Grotens

Title:

Managing Director

Catalytic Distillation Technologies

233793\_1



## APPENDIX A

**Patent Application/Serial No.:** 10/839,398

**Title:** PROCESS AND APPARATUS FOR  
CATALYTIC DISTILLATIONS

**Filed:** 05/05/2004

**Assignee:** Catalytic Distillation Technologies

**Reel/Frame No.:**

**Reference No:** 17344/109004 (CDT 1736 Div 4)

**2. Patent Application/Serial No.:** 10/978,111

**Title:** PROCESS FOR THE PRODUCTION OF  
GASOLINE STOCKS

**Filed:** 10/29/2004

**Assignee:** Catalytic Distillation Technologies

**Reel/Frame No.:** 010763/0766

**Reference No:** 17344/084002 (CDT 1614 Con)

**3. Patent Application/Serial No.:** 10/984,610

**Title:** METHOD OF REMOVING ENTRAINED  
SULFURIC ACID FROM ALKYLATE

**Filed:** 11/09/2004

**Assignee:** Catalytic Distillation Technologies

**Reel/Frame No.:** 013382/0885

**Reference No:** 17344/127002 (CDT 1822 Div)

**4. Patent Application/Serial No.:** 10/926,207

**Title:** SELECTIVE HYDROGENATION OF  
BUTADIENE

**Filed:** 08/25/2004

**Assignee:** Catalytic Distillation Technologies

**Reel/Frame No.:** 015733/0645

**Reference No:** 17344/148001 (CDT 1912)

## **APPENDIX A (cont'd)**

5. **Patent Application/Serial No.:** 11/455,341  
**Title:** LIQUID-CONTINUOUS COLUMN DISTILLATION  
**Filed:** 06/19/2006  
**Assignee:** Catalytic Distillation Technologies  
**Reel/Frame No.:** 013732/0583  
**Reference No:** 17344/115003 (CDT 1749/13 Con 2)
6. **Patent Application/Serial No.:** 11/455,324  
**Title:** ETHERIFICATION PROCESS  
**Filed:** 06/19/2006  
**Assignee:** Catalytic Distillation Technologies  
**Reel/Frame No.:** 015733/0667  
**Reference No:** 17344/149002 (CDT 1914 Con)
7. **Patent Application/Serial No.:** 10/973,746  
**Title:** PARAFFIN ALKYLATION  
**Filed:** 10/26/2004  
**Assignee:** Catalytic Distillation Technologies  
**Reel/Frame No.:** 013199/0646  
**Reference No:** 17344/118004 (CDT 1769 Con 2)
8. **Patent Application/Serial No.:** 11/010,907  
**Title:** SELECTIVE HYDROGENATION OF ACETYLENES  
**Filed:** 12/13/2004  
**Assignee:** Catalytic Distillation Technologies  
**Reel/Frame No.:** 013188/0372  
**Reference No:** 17344/130001 (CDT 1825 Con)

## APPENDIX A (cont'd)

9. **Patent Application/Serial No.:** 11/358,671  
**Title:** PROCESS FOR MAKING DIALKYL CARBONATES  
**Filed:** 02/21/2006  
**Assignee:** Catalytic Distillation Technologies  
**Reel/Frame No.:** 015202/0961  
**Reference No:** 17344/134002 (CDT 1857 Div)
10. **Patent Application/Serial No.:** 11/517,773  
**Title:** LOW TEMPERATURE PROCESS FOR REGENERATING SPENT SULFURIC ACID  
**Filed:** 09/08/2006  
**Assignee:** Catalytic Distillation Technologies  
**Reel/Frame No.:** 018286/0626  
**Reference No:** 17344/169001 (CDT 1986)
11. **Patent Application/Serial No.:** 11/031,900  
**Title:** PROCESS FOR THE SELECTIVE HYDROGENATION OF ALKYNES  
**Filed:** 01/07/2005  
**Assignee:** Catalytic Distillation Technologies  
**Reel/Frame No.:** 016177/0180  
**Reference No:** 17344/145001 (CDT 1896)
12. **Patent Application/Serial No.:** 11/034,460  
**Title:** METHOD OF REMOVING ORGANIC SULFUR COMPOUNDS FROM ALKYLATE  
**Filed:** 01/13/2005  
**Assignee:** Catalytic Distillation Technologies  
**Reel/Frame No.:** 016160/0525  
**Reference No:** 17344/153001 (CDT 1923)

- 13. Patent Application/Serial No.:** 11/505,029  
**Title:** PARAFFIN ALKYLATION  
**Filed:** 08/16/2006  
**Assignee:** Catalytic Distillation Technologies  
**Reel/Frame No.:** 018186/0738  
**Reference No:** 17344/166001 (CDT 1969-2)
- 14. Patent Application/Serial No.:** 11/358,569  
**Title:** PROCESS FOR MAKING DIALKYL CARBONATES  
**Filed:** 02/21/2006  
**Assignee:** Catalytic Distillation Technologies  
**Reel/Frame No.:** 015202/0961  
**Reference No:** 17344/134003 (CDT 1857 Con)
- 15. Patent Application/Serial No.:** 10/820,399  
**Title:** PROCESS FOR THE SELECTIVE DESULFURIZATION OF A MID RANGE GASOLINE CUT  
**Filed:** April 7, 2004  
**Assignee:** Catalytic Distillation Technologies  
**Reel/Frame No.:** 012687/0562  
**Reference No:** 17344/122002 (CDT 1788)

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Application No. (if known): 10/820,399

Attorney Docket No.: 17344/122002

## Certificate of Express Mailing Under 37 CFR 1.10

I hereby certify that this correspondence is being deposited with the United States Postal Service as Express Mail, Airbill No. EM 029485331 US in an envelope addressed to:

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Alexandria, VA 22313-1450

on May 22, 2007  
Date

A handwritten signature in black ink that reads "Ruby Carter-Bridges".

Signature

Ruby Carter-Bridges

Typed or printed name of person signing Certificate

Registration Number, if applicable

(713) 228-8600  
Telephone Number

Note: Each paper must have its own certificate of mailing, or this certificate must identify each submitted paper.

Appeal Brief Transmittal (1 page)  
Amended Appeal Brief (20 pages)